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ABSTRACT

Recent attempts to reduce the adverse impact of examinations have focused on alternatives to written tests. The present report, however, demonstrates how the adverse impact of written tests can be reduced by correcting for the degree to which a job applicant had been educationally and/or economically disadvantaged or deprived. A measure of disadvantagedness containing nine items was internally and externally validated with 11,931 applicants for a nationwide examination. Internal validation was demonstrated by a factor analysis that yielded two factors. External validation was based on the relationships of scores on the two factors with other variables: minority status, test performance, and educational level; each assumed relationship was confirmed. A composite measure of the two factor scores, called D, had a point biserial correlation of -.31 with passing the test and .54 with minority status. The adverse impact of the test was substantially reduced by partialling D out of test performance. It was also demonstrated that partialling D out of test performance would not necessarily reduce the validity of the test and could actually improve it. (Author/PN)

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REDUCING ADVERSE IMPACT VIA A MEASURE OF APPLICANT DISADVANTAGEDNESS

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SUMMARY

Recent attempts to reduce the adverse impact of examinations have focused on alternatives to written tests. The present report, on the other hand, demonstrates how the adverse impact of written tests can be reduced by correcting for the degree to which a job applicant had been educationally and/or economically disadvantaged or deprived.

A measure of disadvantagedness containing nine items was internally and externally validated with 11,931 applicants for a nationwide, examination. Internal validation was demonstrated by a factor analysis that yielded two factors. External validation was based on the relationships of scores on the two factors with other variables: minority status, test performance, and educational level; each assumed relationship was confirmed.

A composite measure of the two factor scores, called D, had a point biserial correlation of -.31 with passing the test and .54 with minority status. The adverse impact of the test was substantially reduced by partialling D out of test performance. It was also demonstrated that partialling D out of test performance would not necessarily reduce the validity of the test, and could actually improve it.

INTRODUCTION

It has proven difficult to design valid selection procedures that have no adverse impact. Some employers believe the solution is to avoid the use of written tests. This approach, however, will fail to the extent that the alternative selection device has adverse impact, lacks validity, or is not cost effective.

The approach adopted in the present paper is not to eliminate the entire test--but to statistically partial out that part of it that is undesirable. If whites as a group do better on a test because they have had more advantages than minorities, then it is a simple matter to reduce the adverse impact of the test by statistically controlling for disadvantagedness. A measure of disadvantagedness is, of course, needed to make this correction.

TM 820 610

*The statements expressed in this papers are those of the author and do not necessarily reflect official policies or opinions. Assisting at various stages of the project were John Kraft, Lois Northrop, Henrietta McClure, Anthony Mento, and Robert McKenzie.

The present paper addresses such question as:

- Can a measure of disadvantagedness be developed that is appropriate for applicants for a particular examination? Such applicants would, of course, be more homogeneous than the population at large.
- Can the adverse impact of a specific written test be reduced when the educational and economic disadvantagedness of applicants is partialled out?
- Must a test that does not handicap disadvantaged applicants be less valid than its conventional counterpart?

Assumptions

It was assumed (e.g., Bachman, 1972; Tyler, 1965) that disadvantagedness while one is growing up is related to the following:

- father's education and job (negative relationship);
- mother's education and job (negative relationship);
- lack of familiarity with the English language;
- type of community one grew up in (e.g., fewer advantages in the big city than in the suburbs);
- ethnic group (minorities more disadvantaged than whites--but intragroup differences);
- test performance as an adult (negative relationship);
- highest level of education (negative relationship).

METHOD

Procedure

Three self-administering questionnaires—CSC Form 1289-A (Temp), CSC Form 1310 (Temp), and CSC Form 1203-[illegible]—were given to all applicants nationwide who took a specific written test during 1978. Completed forms were optically scanned and the data recorded on computer tape. The author was assigned to the project after all the data had been collected.

CSC Form 1289-A (Temp) has seven questions: name, date, social security number, examining office code, race, sex, and ethnicity. Non-Hispanic whites were the majority group; all other ethnic groups were combined to form the minority group.

CSC Form 1310 (Temp) has 16 questions: name, date, year of birth, social security number, examining office code, type of mathematics courses taken, questions about conditions while they were growing up (type of community, whether English was the primary language spoken in home or school, and the perception of economic and educational advantage in the home), the most important occupation and the highest level of

education of parents (or guardians), whether they or members of their family are currently employed by the Federal government, and whether they claim veteran preference.

CSC Form 1203-N has 10 questions: name, date, social security number, data available to start work, occupational specialty (applicants for another job took the same written test), regional preference, Spanish language ability, educational level, length of qualifying experience, and previous experience.

All the data generated by the first two forms were available to this investigator, with the exception of type of math courses taken. Data from the last form were available only for those applicants who passed the written test.

The written test consists of 65 items of the following types: 30 vocabulary, 15 English usage, 10 judgment, and 10 logical order of events. An applicant's score is the number of right answers; 35 is passing. Scores between 35 and 65 are transmuted on a point-by-point basis to ratings.

Sample

Data were obtained from 11,931 applicants. It was impossible to determine what percent this was of the total number of applicants; i.e., it was impossible to determine the return rate. However, Northrop (Note 1) found a 98% return rate for another nationwide examination.

The mean year of birth was 1951.8 (S.D. = 4.2). Females accounted for 9.2% of the sample. Included in the sample were 6821 whites, 3699 Hispanics, and 963 blacks.

Scaling the Items Used to Measure Disadvantagedness

The nine items used to measure disadvantagedness are from CSC Form 1310 (Temp) Nov. 1977. Although this form was developed by personnel psychologists with the intention of measuring socio-economic level, the items appear to be compatible with the measurement of disadvantagedness; it was only necessary to score them in the opposite direction from that originally intended. In fact, two of the items (concerning perceptions of economic and educational advantage) appear to be more closely related to disadvantagedness than to socio-economic level.

Scale values for these items were computed on half the sample (S1). Each alternative was given a value from 0 to 13 (least to greatest disadvantagedness, based on the judgment of the researcher).

A simple sum score (called initial D) of the nine items was computed for each individual in S1. The mean initial D for all individuals who answered an item in any particular way was computed. For example, the mean initial D of all those applicants who indicated they grew up on a farm was computed; likewise, the mean initial D for those who grew up in a small town; etc. For each item, the alternative with the lowest mean initial D was arbitrarily set to 0; and the alternative with the largest mean initial D, 20. Alternatives with intermediate initial D's were assigned whole numbers between 0 and 20 depending on their relative distances between the high and low points.

VALIDATION OF THE MEASURE OF DISADVANTAGEDNESS

Internal Validation of Disadvantagedness Items

Factor analysis was applied to the second half of the sample (S2) to develop evidence concerning the internal validity of the nine disadvantagedness items. Response to the items were assigned the scale values generated on S1. An iterative factor analysis of the intercorrelations between the items produced two significant roots. The program iterated until the number of significant roots was decided and the diagonal estimates stabilized. Varimax rotation was used to simplify the factor structure. The first factor accounted for 29% of the variance; the second factor, 11%.

Seven of the nine items, the highest of which were mother's education (.77) and father's education (.76), loaded at least .42 on the first factor (see Table 1). This factor was named General Disadvantagedness. Type of community (.98) was the only item that loaded higher than .08 on the second factor. This factor was named Community Disadvantagedness.

TABLE 1

Loadings of Two Factor Extracted from Intercorrelations Between Pairs of Disadvantagedness Items (N = 5965)

Questionnaire Item	Factor I	Factor II
Mother's Education	.77	.06
Father's Education	.76	.08
Father's Job	.69	.06
Spoken Language	.52	.08
Educational Advantage	.51	.05
Mother's Job	.51	.00
Economic Advantage	.42	.06
School Language	.16	.03
Type of Community	.10	.98

External Validation

An external check on whether a factor is measuring disadvantagedness is to determine its relationship with other variables. Factor scores based on standardized scores and factor loadings were correlated with test performance, minority status, level of education, sex and year of birth. From the correlations in Table 2, it is clear that high Factor I scores were associated with low test performance, being a member of a minority group, low educational level, and being old.

TABLE 2

Correlations of Two Disadvantagedness Factor Scores With Selected Dichotomized Variables

Selected Variable	Factor I	Factor II	N
Test Performance (pass = 1, fail =0)	-.30*	-.09*	5965
Minority Status (minority = 1, white = 0)	.52*	.12*	5877
Educational Level	-.11*	-.05*	2985
Sex (male = 1, female = 2)	.00	.00	5900
Year of Birth	-.15*	-.05*	5948

*$p < .01$

Factor II scores had the same correlational profile as Factor I scores, the only difference being the magnitude of the correlations. Both factors therefore exhibited the correlational profile that had been assumed to exist for disadvantagedness. The two sets of factor scores correlated -.022. Neither set of factor scores had a sex bias; however, both demonstrated a bias towards younger applicants. An overall measure of disadvantagedness, based on the two sets of factor scores was effected by a conventional multiple regression paradigm utilizing minority status as the dependent variable; the weights came from S1. The combination of the two factor scores will be referred to as D. D correlated -.31 with test performance and .54 with minority status.

Use of D to Reduce Adverse Impact

The correlation of test performance with minority status is an easily computed, albeit crude, index of the adverse impact of a test. The four-fold point correlation between test performance (pass/fail) and minority status (minority/majority) was -.419 (significant at the .01 level).

D was partialled out of the test scores, producing in effect D-less test scores. The adverse impact of these D-less test scores was estimated by correlating them with minority status (r_p = -.335). Thus, controlling for D reduced the adverse impact of passing the test substantially--but hardly completely.

Neither the conventional test nor the D-less test demonstrated a significant sex bias. In fact, the correlation of test performance with sex was virtually zero.

Estimated Validity of D-Less Test Scores

Although the criterion-related validity of D-less test scores has not yet been determined, estimates of it can be generated based on assumptions about correlations of a criterion measure with (1) the conventional test and (2) D. It was assumed that the criterion correlation for the conventional test was between .2 and .4, and for D between .0 and -.2. Partialling D out of the conventional test scores and correlating the result with the criterion, produces the validity coefficients in Table 3. As the validity of the conventional test increases, so does the validity of the D-less test. In no case does the D-less test lose all its validity, not even when the conventional test validity is .20 and D correlates -.20 with the criterion. When D correlates .00 with the criterion, the validity of the D-less test actually exceeds the validity of the conventional test.

TABLE 3

Validity Coefficients of D-Less Test as a Function of Conventional Test Validity and Correlation of D with the Criterion

Possible Correlation of D with Criterion	Possible Validity of Conventional Test .20	.30	.40
.00	.22	.33	.45
-.10	.19	.30	.41
-.20	.15	.26	.35

Note. Validity Coefficients are product moment correlations.

DISCUSSION AND CONCLUSIONS

The measurement of disadvantagedness in the present study was based on nine items. Although these items appeared to be effective indicators of disadvantagedness, they have limitations from a psychological point of view in that they are global or outputs, rather than processes or behaviors. For example, the type of community one grew up in is a very crude overall indicator of the presence of: libraries, museums, role models, reinforcement of intellectual behavior, and positive peer attitudes toward education. A better measure of disadvantagedness would rely on specific, psychologically rich indicators.

Because of the limitations of the items used to measure D and because of the limited sample (applicants for a single examination during 1978), generalization to other situations is dangerous. Future studies of other classes could provide the type of information needed to derive generalizations about the measurement of disadvantagedness and its relationship with constructs in the occupational setting.

The measure of D was based on research items. Before a measure of D could be used operationally, the items would have to be reprinted as part of the examination. The possibility that this could affect the candor of the applicants should be studied.

If D has low or negative validity the D-less test will have approximately the same validity as the conventional test.

REFERENCE NOTE

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